NEWSLETTER

January 1981

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FIRE BLIGHT

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INTERNATIONAL WORKING GROUP

ON FIRE BLIGHT RESEARCH

INTERNATIONAL WORKING GROUP ON FIRE BLIGHT RESEARCH

N E W S L E T T E R

Plant Protection Commission

International Society for Horticultural Science

in cooperation with

U.S. Apple and Pear Disease Workers

and

European & Mediterranean Plant Protection Organization

JANUARY 1981

UNITED STATES DEPARTMENT OF AGRICULTURE
Science & Education Administration

Appalachian Fruit Research Station
Kearneysville, West Virginia, USA

Letter from the Editor

During the year 1980, and especially since our second International Workshop in Kiel/Schilksee, the total list of persons interested in fire blight has increased to 228. As was expected, the workshop caused an increase of 100% in the membership from West Germany (BRD).

The workshop was a total success and Dr. Zeller is to be congratulated once more for his able leadership regarding all the local arrangements for meeting facilities, lodging, dining and the superb planning of the bus tour to visit the fire blight test plots near Husum, the drive through the characteristic landscape of Schleswig-Holstein including the lunch stop for smoked eel in a local restaurant, and finally, the visit to the old castle in Schleswig.

The fire blight workshop is organized as one of the Working Groups under the Plant Protection Commission of the International Society for Horticultural Science (ISHS) and meets in cooperation with the European and Mediterranean Plant Protection Organization (EPPO) with headquarters in Paris. There were approximately 60 participants in attendance representing 14 countries. Attending from North America were: H. S. Aldwinckle and J. L. Norelli (Geneva, N.Y.), S. V. Beer (Ithaca, N.Y.), S. M. Ries (Urbana, Ill.), T. van der Zwet (Kearneysville, W.Va.), and W. G. Bonn (Harrow, Ontario). A total of 24 papers were presented, and the abstracts are included in this newsletter. The complete papers are to be published in Acta Horticulturae No. 117, which can be purchased from the office of the Secretary General of ISHS, Bezuidenhoutseweg 73, The Hague, The Netherlands.

It appears a blessing that fire blight in Europe is not spreading any faster than originally expected. Continuous use of eradication procedures in areas where the disease shows up and the application of all possible preventive measures in regions and countries without fire blight, could very well delay spread of the disease a long time.

The annual communication through our Newsletter between all persons interested in fire blight should keep all of us abreast of the latest information on the disease. I urge all of you to use the newsletters to your fullest advantage. The central library of all fire blight literature at our station is at your disposal when you need a copy of a publication you are unable to obtain any other way. We are currently in the process to computerize the total collection.

Tom van der Zwet

Tom van der Zwet, Secretary
North American Section
International Working Group
on Fire Blight Research

Members of the International Working Group on Fire Blight

attending the Second International ISHS Meeting

in Schleswig--Holstein, West Germany,

September 16-18, 1980.

SECOND INTERNATIONAL ISHS-MEETING

OF THE WORKING-GROUP ON FIREBLIGH

ABSTRACTS

KIEL - SCHILKSEE, Sept. 16 - 18, 1980

A B S T R A C T S [1/]

MOTILITY AND CHEMOTAXIS OF ERWINIA AMYLOVORA

Raymundo, A. K. and Ries, S. M. (United States)[2/]

Flagella synthesis by Erwinia amylovora is temperature dependent with an optimum at 18-25 C. For motility to occur, a chelating agent and a pH of 6-9 are required. An external energy source is not required for motility although mannitol and glucose are stimulatory. Energy for motility can be derived from oxygen dependent metabolism of endogenous energy sources. Motility can occur under anaerobic conditions if an energy source is provided which can be metabolized in the absence of oxygen. Erwinia amylovora cells inside host tissues are not motile but become motile when placed in contact with free water at temperatures optimal of flagella synthesis. Chemotaxis of Erwinia amylovora is temperature and pH dependent with an optimum temperature range of 20-28 C and pH 6-8. An incubation period of 30 minutes and a cell population not greater than 4 x 10^7 cells/ml are optimal for chemotaxis studies. A medium consisting of 10^{-3} M mannitol, 10^{-2} M $MgCl_2$ and 10^{-2} M potassium phosphate buffer at pH 7 was established for assays. Using these assay conditions, E amylovora exhibits positive chemotaxis to apple nectar, to the organic acid fraction of apple nectar, to one amino acid, aspartate, to the organic acids fumarate, malate, maleate, malonate, oxaloacetate, and succinate, but is not to any of the sugars tested. All attractants are dicarboxylic acids and responses of E. amylovora are uniformly inhibited by malate suggesting a single chemoreceptor site for all the attractants. The chemoattractant response pattern of our strain and that of American Type Culture Collection strain #19382 of E. amylovora was identical.

OVERWINTERING OF ERWINIA AMYLOVORA: SOURCES OF INOCULUM IN SPRING

Paulin, J. P., Lachaud, G. and Chartier, R. (France)

In the contaminated area of DAX (Southern France), detection of E. amylovora has been attemped twice a month from September '79 to May '80 from a pear orchard which showed some symtoms in '78-'79 and from the immediate surroundings of this orchard. Samples were taken on healthy looking or diseased host plants, non host plants, soil... etc. Three different techniques have been used and compared (ordinary medium, selective media, immunofluorescence). Results are discussed.

1/ The complete papers of these abstracts will be published in Acta Horticulturae No. 117

2/ In the interest of conserving space, addresses of authors are listed in the back of this newsletter.

MONITORING OF EPIPHYTIC ERWINIA AMYLOVORA AND THE INCIDENCE OF FIRE BLIGHT OF APPLE AND PEAR IN SOUTHWESTERN ONTARIO

Bonn, W. G. (Canada)

Monitoring of apple and pear orchards for epiphytic Erwinia amylovora on blossoms and leaves revealed that this method could not be relied upon to predict the occurrence of fire blight disease outbreaks in southwestern Ontario. Epiphytic E. amylovora was detected in only four of 19 apple and pear orchards although fire blight occurred in all of them later in the season. Disease severity as measured by new infections in individual orchards ranged from 0.15 - 8.90 strikes/tree for apples and 0.29 - 1.3[illegible] strikes/tree for pears. In contrast, hold-over cankers were more numerous in pears than in apples.

SEASONAL CHANGES OF EPIPHYTIC ERWINIA AMYLOVORA ON ORNAMENTALS IN RELATION TO WEATHER CONDITIONS AND THE COURSE OF INFECTION

Brulez, W. and Zeller, W. (West Germany)

Studies on the epidemiology of fire blight on different ornamentals were carried out under natural infection conditions on the west coast of Schleswig-Holstein in the Fed. Rep. of Germany in 1979 and 1980. Some correlations between the weather conditions, the course of infection and the epiphytic populations of E. amylovora on apparently healthy leaves and blossoms of three species of Cotoneaster are discussed. The pathogen could be detected epiphytically on leaves of the highly susceptible Cotoneaster watereri during a period with temperatures under 15°C and 4 weeks before the first symptom expression. On the moderately susceptible C. dammeri var. radicans, however, colonies of E. amylovora could only be found sporadically and without a later expression of symptoms.

THE MONITORING SYSTEM OF ERWINIA AMYLOVORA (BURRILL) WINSLOW ET AL. IN BELGIUM

Geenen, J., Vantomme, R. and Veldeman, R. (Belgium)

The last years, Erwinia amylovora, the causal organism of fire blight has been detected in several regions. Up to now chemical control seems to be insufficient for lack of effective bactericides, as antibiotics may not oe used. By ministerial decree, the arboricultural centres of Beernem, Wetteren and Lesdain as well as the fruit tree production region around St. Truiden are to be considered as protected areas subjected to regulary

organised prospections. In these areas host plants of E. amylovora were selected at a distance of 5 km. During the growing season these host plants were sampled every 14 days in order to detect the epiphytic presence of E. amylovora before symptoms are visible. Since we proved the number of bacteria detected by immunofluorescence microscopy being in direct correlation of inoculum on plant surface, the outbreak of infections.

WEATHER ANALYSIS AND FIRE BLIGHT IN DIFFERENT CLIMATES

Billing, E. (United Kingdom)

A system of weather analysis developed for fire blight warnings in south-east England appears to be applicable in other climates. It is presented in a simple diagrammatic form which allows rapid between-season and between-climate comparisons and is complementary to other fire blight warning systems. Examples will be shown.

WEATHER ANALYSIS AND FIRE BLIGHT IN THE NETHERLANDS

Billing, E. and Meijneke, C. A. R. (U. K. and Netherlands)

Outbreaks of fire blight in the Netherlands from 1971-1978 were examined using a system of weather analysis developed for south-east England. Examples show that the system offers explanations for fluctuations in disease incidence or severity in different hosts and different areas. The system seems to be applicable in the Netherlands; further tests are needed to determine its predictive value.

THE DEVELOPMENT OF FIRE BLIGHT IN THE NETHERLANDS DURING 1979 AND ITS EXPLANATION BY THE SYSTEM BILLING

Meijneke, C. A. R. and van Teijlingen, M. (Netherlands)

The heavy outbreak of fire blight in the Netherlands in 1979 could be largely explained by applying the principles of the system Billing in an analysis of the facts which had been collected during that year. The facts and their analysis will be presented. As a result a number of observation-posts has been set-up in 1980 in order to check more thoroughly the reliability of the criteria used in the system Billing under Dutch conditions, the aim being to lay the base for a spray warning system for fruitgrowers.

NOTES ON FIRE BLIGHT IN THE LANDSCAPE IN DENMARK

Mosegaard, J. (Denmark)

Illustrated by some slides I want to describe the nearly stationary situation on old infected spots and some new, treated as well as untreated. The paper will discuss different theses on the way that fire blight is spread over short and longer distances according to the wild flora in Denmark, The Netherlands, Poland, and New Zealand. The question of the connection between wild hosts and infections in cultivated trees and shrubs will be given. Also that summer infections are more important than flower infection when fire blight is spread over longer distances.

INFLUENCE OF THE HONEYBEE ON THE TRANSMISSION OF FIRE BLIGHT

van Laere, O., de Greef, M. and de Wael, L. (Belgium)

Cotoneaster salicifolia plants were subjected to possible infection by bees in isolated glass house compartments in order to study the influence of bees on transferring fire blight infection. It has been demonstrated from the different tests that bees, while visiting the flowers, are able to transfer an Erwinia infection to healthy plants (Cotoneaster salicifolia): 1. after having been sprayed with an Erwinia suspension; 2. after having ingested a sugar solution, contaminated with Erwinia and 3. after having visited contaminated flowers. No transfer of infection was found in the control tests.

BIOLOGICAL CONTROL OF FIRE BLIGHT

Beer, V. (United States)

Bacteria that are not pathogenic to apple and pear are being studied for use as potential biological control agents for fire blight. Living nonpathogenic bacteria and bacteriocins that inhibit Erwinia amylovora, in vitro, have been evaluated for their influence on the incidence of fire blight infection. Test preparations (suspensions of viable bacteria or cell-free bacteriocin preparations) were applied to apple blossoms in a research orchard both before and after inoculation with E. amylovora. In 1979, two strains of E. herbicola provided significant control of infection when applied at 10^6 and 10^8 colony forming units per milliliter. With the higher concentration, control was equivalent to that achieved with 100 mg/l of streptomycin. One of the strains tested produces, In vitro, a bacteriocin (MW. 800) that inhibits E. amylovora;

the other strain does not produce a bacteriocin. However, both strains provided equivalent control. Cell-free culture supernatents containing bacteriocin also significantly reduced the incidence of infection; a comparable preparation from a nonbacteriocinogenic strain did not affect disease incidence. In 1980, a bacteriocinogenic strain of E. herbicola and a mitomycin C-induced nonbacteriocinogenic mutant of it were evaluated. Both strains significantly reduced the incidence of infection, but not to the same extent as 100 mg/l of streptomycin. Furthermore, when blossoms, which were treated with the bacteriocinogenic strain of E. herbicola, were inoculated with two strains of E. amylovora, one that was sensitive to and one that was resistant to the bacteriocin in vitro, disease control was equivalent. Partially purified bacteriocins from E. herbicola had little effect on disease development. Our data indicate that the incidence of fire blight can be reduced by treating apple blossoms with nonpathogenic bacteria and that control is based on mechanisms other than bacteriocinogenicity

NO ANTAGONISTIC EFFECT OF LEAF SURFACE MICROORGANISMS ON THE FIRE BLIGHT PATHOGEN IN MODEL EXPERIMENTS

Knôsel, D. (West Germany)

On proving plants for the fire blight pathogen characteristic yellow colonies of Erwinia herbicola occured regularly on the nutritive substratum. The germination numbers differed depending on the host plant, habitat, season and weather between 10^2 to 10^6 bacteria/g leaf material. The share of other epiphytic bacteria and fungi was generally lower. A series of these leaf surface organisms was isolated and tested in vitro for antagonistic effect on Erwinia amylovora. None of the numerous strains of E. herbicola caused any inhibition. Bacillus subtilis and other Bacillus spp. had a more or less inhibiting influence on the fire blight pathogen in vitro. After contacting the epiphytic microorganisms with the pathogen on the host plant, Cotoneaster dammeri 'Skogholm,' by spraying one after the other or together on the leaves no antagonistic effect could be proved. The plants fell sick without any delay.

METHODS FOR EVALUATING NEW CHEMICALS FOR THE CONTROL OF INFECTION OF APPLE BY ERWINIA AMYLOVORA

Norelli, J. L. and Gilpatrick, J. D. (United States)

Field evaluation of new chemicals for their ability to control fire blight is limited by the expense and seasonability of field testing. Although field testing is essential, there is a need for inexpensive, fast and reliable methods for the preliminary evaluation of experimental compounds.

The development of two such test methods will be discussed. One test involves the use of immature green pear fruit tissue and the other the use of germinating apple seedlings. The "positive" controls streptomycin (Agristrep), cupric hydroxide (Kocide), MBR-10995 (3M Co) and the "negative" controls mancozeb (Dithane M-45), captan, benlate were evaluated by field tests during bloom, the green pear fruit tissue test, the germinating apple seedling test, a greenhouse apple shoot test and by a laboratory zone of inhibition tests. There was good agreement among the results from the green pear fruit tissue test, the germinating apple seedling test and the field test during bloom; however, there was poor agreement among greenhouse shoot tests, laboratory zone of inhibition tests and field tests. Preliminary test method results and field test results will be discussed for the experimental compounds iprodione, KL-470 (KALO Labs), KL-496 (KALO Labs), oxytetracycline and A-16886B (Eli Lilly and Co).

EXPERIENCE WITH CHEMICALS AGAINST ERWINIA AMYLOVORA

Kooistra, T. and Langeslag, J. (Netherlands)

The efficacy against artificial inoculation with E. amylovora of different copper compounds, 3 experimental bactericides, 7 fungicides of pome fruit culture, 4 disinfectants and two quinolate compounds were tested on Cotoneaster, spp., pear and quince. In the preventive trials on flowering plants the 3 copper products were equally active. Two new bactericides reached the level of strepto-mycin, the other was somewhat inferior. The bactericidal side-effect of the fungicides were negligible. The disinfectants and quinolate compounds were ineffective. The curative control of the two bactericides used tended with the test plant. The four bactericides used showed preventive action against shoot inoculation, but no curative control. There was a small noteworthy influence of the inoculum density of the inoculated bacterium on the control level. The opportunity of permitting new products for fire blight control was discussed.

CGA 78039, A NOVEL BACTERICIDE FOR THE CONTROL OF FIRE BLIGHT

Egli, T. and Zeller, W. (Switzerland and W. Germany)

A noval synthetic bactericide for fire blight control has been discovered by Ciba-Geigy Ltd, Basle, Switzerland. Preliminary data from field trials with pear and cotoneaster look very promising.

SEVERITY OF ERWINIA AMYLOVORA INFECTION ON SHOOTS OF APPLE CULTIVARS: CUMULATIVE RESULTS

Aldwinckle, S. (United States)

The damage caused by fire blight on apple trees depends on both the number of infections and their severity. To provide objective data on the severity of fire blight on different apple genotypes, the tips of vegetative shoots of single-shoot plants were injected with a suspension of 10^{10} cells/ml of a virulent strain of Erwinia amylovora, and the length of the resultant lesion was determined as a proportion of the length of current season's shoots. During the past seven years, over 300 named cultivars, numbered selections, and Malus species clones have been assessed in this way. Among these genotypes, large differences in susceptibility have been observed. It is now possible to recommend which cultivars should not be planted in regions where fire blight is endemic now or likely to become so in the near future. If available, breeders' selections are tested before introduction so that fire blight susceptibility can be considered as an important criterion for release. Knowledge of susceptibility of cultivars in existing plantings can be used in forecasting disease and the advisability of protectant sprays. Highly resistant genotypes are being utilized in programs for breeding new resistant cultivars and rootstock clones.

VARIETAL DIFFERENCES IN INCIDENCE OF INFECTION OF APPLE BLOSSOMS AND SHOOTS BY ERWINIA AMYLOVORA

Aldwinckle, S. and Norelli, J. L. (United States)

The product of the incidence of infections and their severity determines the amount of damage caused by fire blight on apple trees. The incidence of both blossom and shoot infections following artificial inoculation with Erwinia amylovora was determined on 6-year-old trees of 37 cultivars on M.7 rootstock. Cultivars were divided into early, mid and late blooming groups so that blossoms of equal maturity could be inoculated. A suspension of 0.7×10^7 or 0.7×10^5 cells/ml of a virulent isolate of E. amylovora was atomized onto the open blossoms with compressed N_2. The proportion of inoculated clusters that became infected was recorded 4 wk later. Significant differences in incidence of blossom infection occurred between cultivars. Vegetative shoots of the same trees were inoculated 6 wk after bloom by bisecting the youngest unfolded leaf on the shoot with scissors dipped in a suspension of 10^8 or 10^6 cells/ml of E. amylovora. Three wk after inoculation, the proportion of inoculated shoots that became infected was recorded. Significant differences in incidence of infection occurred between cultivars. The incidence of blossom infections will be compared with the incidence of shoot infections. The incidence of infections in these tests will be compared with severity of infections resulting from injection of shoot tips with high doses of E. amylovora.

PEAR BREEDING FOR FIRE BLIGHT RESISTANCE PROGRAM AND FIRST STUDIES IN FRANCE

Thibault, B. (France)

The aim of this program, started in 1975, is to find some resistant or not too susceptible varieties with a late picking date (30 to 50 days after 'Williams'). The first crosses were made between a susceptible parent with good fruit quality, ('General LeClerc,' 'Notaire Lepin') and a parent with blight resistance ('Maxine,' 'Mac,' 'Dawn'). The last year, crosses were made only between resistant or not too susceptible varieties, mainly belonging to the genus Pyrus communis. A half diallel cross will be realised with 7 parents. Testing the resistance is made either outside in the southwest of France or in greenhouses in the frame of the C.E.E. cooperation. The first results are given.

SOME FACTORS AFFECTING SELECTION FOR FIRE BLIGHT RESISTANCE IN PEAR

van der Zwet, T., Bell, R. L., and Blake, R. C. (United States)

The efficiency of maintaining large populations of pear seedlings in the field is dependent upon an effective method of mass-inoculating seedlings in the greenhouse to eliminate those most susceptible to fire blight (Erwinia amylovora). After several thousand seedlings of the 1967-1969 crosses were inoculated, and the most resistant ones were compared for 10 years in the field against unscreened seedlings of the same crosses, significantly more screened than unscreened seedlings were scored as resistant or moderately resistant, and fewer were scored as susceptible. When the degree of fire blight in unscreened seedlings was compared between two locations of planting, significantly more trees were found severely blighted in Ohio than in Maryland. This is primarily due to better soil and much more vigorous growth of the trees in Ohio. The relationship between the end of juvenility and the incidence of first fire blight infection in nearly 12,000 seedlings was analyzed. The mean juvenile period was 5.1 years and the mean age at first blight was 6.4 years. A small but highly significant correlation was found between the age of seedling trees at first bloom and the age when first blight appeared. This substantiates previous observations that the presence of bloom and the transition to the adult phase is not necessarily a major factor in susceptibility to fire blight.

THE VALUE OF TOPLEAF INOCULATION TO DEMONSTRATE GENETIC RESISTANCE IN VARIOUS POMOIDEAE SPECIES TO ERWINIA AMYLOVORA

Maas Geesteranus, H. P. and Heyting, J. (Netherlands)

When testing the susceptibility of seedlings or young plants, partly obtained from various breeding programs of Pear, Ornamental Malus, Crataegus or Pyrancantha to Erwinia amylovora, the observed disease symptoms could be classified in various groups: a) No development of symptoms, b) Discoloration of the inoculated leaf, c) Necrosis of the inoculated leaf only (necrotic spots, necrosis of the mid-vein, total wilting of the inoculated leaf. d) Total necrosis of the apical bud. e) Spreading of the bacteria into the stem, resulting in wilting of the shoot. These different symptoms may be caused by: 1. The number of bacteria and additional toxin, that penetrated in inoculated leaftop, 2. The physiological condition of the individual plant, 3. The genetic composition of a plant. To answer the question whether the classified groups a-e are based on a genetic composition of resistance genes, seedlings out of a Pyracantha breeding program were propagated by cuttings, in the supposition, that if the lack of symptom appearance is based on this genetic composition, all plants from one clone should react similar. Preliminary results demonstrate, that if no genetic resistance is present, all individuals of the clone and all hybrids (clones) will be susceptible. If resistance is present in one of the parents, the hybrids are supposed to be either resistant or susceptible and all individuals within a clone ought to behave similarly. However the genetic composition of both parents and the hybrids seem to be more complicated in general. If resistance is present in the hybrid up to a certain level, this resistance may be overshadowed by the susceptibility due to the individual physiological variation.

SOME PROGRESS IN BREEDING COTONEASTER FOR RESISTANCE TO FIRE BLIGHT, ERWINIA AMYLOVORA (BURR.) WINSLOW ET AL

Persiel, F. and Zeller, W. (West Germany)

Since the first report about the examinations of several species, varieties and oecotypes in an experimental field near Husum, West Germany, breeding for resistance to fire blight in the genus Cotoneaster has made some progress. Infection tests are no longer made in the field mentioned above. The test plants are now cultivated in containers in a greenhouse at Ahrensburg. They are infected at Kiel-Kitzeberg. This procedure proved to be more suitable for breeding work. Progenies from crossings with C. dammeri var. radicans differed significantly in susceptibility to Erwinia amylovora. So also did two offsprings from resistant plants of C. dammeri var. radicans. Above all a progeny from the crossing C. dammeri var. radicans x C. lucidus was promising for further breeding work.

PHYTOSANITARY MEASUREMENT TO PREVENT THE INTRODUCTION OF FIRE BLIGHT IN SWITZERLAND

Grimm, R. (Switzerland)

So far, fire blight has not been found in Switzerland. But the disease has reached the southwest of France. There is the possibility and danger that it could invade Switzerland, Italy and Austria, not only from the north, but also from the southern and western side. It is absolutely forbidden to import host plants of fire blight into Switzerland. Generally, it requires an official permission to import some scions of new varieties. The imported material has to remain in our quarantine station for two years. Because of the situation of fire blight in Europe, Switzerland exports much material from its nurseries. In order to look for fire blight symptoms, we have set up a control service for the export nurseries. Suspected plant material will be tested as quickly as possible in our bacteriological laboratory, in order to provide the necessary preventive measures. Our diagnosis service is well established and is free of charge for everybody. When we examined the meteorological infection conditions in the most important regions of fruit production in Switzerland, we found that our northern regions are not less endangered to fire blight attack. Our aim is to find ornamental plants which are resistant to fire blight. This would be a possibility to give way for the production of an alternative assortment in the nurseries. There are specific Swiss apple and pear varieties, which are included in a test program of the BBA Kiel towards susceptibility to fire blight.

FIVE YEARS OF EXPERIENCE IN FIRE BLIGHT CONTROL IN LOWER RHINE AREA

Massfeller, D. (West Germany)

In all countries fire blight is known as one of the most dangerous and severe plant diseases. The measurements to fight the disease range from quarantine prescriptions to ensure the exclusion of the import of diseased or all host plants from attacked areas over to detect and destroy all attacked (or suspicious to be attacked) plants in countries which have fire blight. In 1973 the Ministry of Agriculture of the Federal Republic of Germany published a decree (3rd Verordnung zur Bekämpfung der Feuerbrandkrankheit) obliging people to make known to the government or to the plant protection service the appearance (or the suspicion of the appearance) of the fire blight disease on susceptible plants. On the other hand, the plant protection service should supervise all stocks of host plants in nurseries and in the public greens. The effectiveness of this work depends on the number of coworkers. The paper deals with how it has tried to solve this problem in the North Rhine District and shows some ways to support the success for eradication of fire blight by some additional measures, since the disease found there for the first time in 1975.

PRESENT STATUS AND NEW OCCURRENCES OF FIRE BLIGHT

WASHINGTON

This was a historic fire blight year in much of Washington. Fire blight reached an epidemic stage in the Yakima valley and parts of the Columbia Basin during the summer of 1980. Older pear growers described the situation as the worst in 40 years. There is no doubt in my mind that it set a record for my 20 years of observation. I would estimate losses of 20 to 30 percent of the bearing area in some blocks. With limited documentation (weather data and blossom counts in only one orchard), what happened may be summarized as follows. In mid-May a heavy rattail bloom occurred over about a two week period. Temperatures during the early part of this period were relatively low, but on May 17 temperatures did excee a mean of 60°F. On May 18 the heavy ash fall occurred (temperature maximums about 65°F and minimums about 52°F). For the next three days temperatures did not drop below 57°F and the maximums were in the mid-70's. The heavy ash deposits from the eruption of Mount St. Helens prevented any control measures. By the end of May it was obvious that records would be set. While all of the initial infections were in the blossoms, by late in the summer twig blight was also prevalent. One grower known to have sprayed on May 17 had only minimal losses. Preliminary greenhouse tests indicate that the ash may be substituted for carborundum as a wounding agent. Of supplemental interest, streptomycin resistance has been found in the Wenatchee River valley and in East Wenatchee. Thus, the White Salmon area is the only pear growing district free from resistance.

R. P. Covey
Wenatchee

CALIFORNIA

Above average incidence of late spring fire blight due to unusually cool weather early in the season which prolonged the blossom period in California pear districts.

W. J. Moller
Davis

OREGON

Blight was very severe in northern Oregon in 1980; as a matter of fact, the worst I have seen it in years.

I. C. MacSwan
Corvallis

NEW YORK

Hudson Valley--Severe blossom infection on pears that were not treated with streptomycin during bloom. Some infection of early blooming apples. Ideal conditions for infection occurred during bloom.
Western N. Y.--Several apple orchards severly affected by fire blight following mid-season hailstorms. Several apple cultivars affected, particularly 20-ounce.

S. V. Beer
Ithaca

DELAWARE

Less fire blight in middle and northern Delaware in 1980 season than in past 10 years, probably due to below normal rainfall.

S. H. Davidson
Wilmington

GEORGIA

Fire blight has been relatively quiet in the Southeastern United States for several years. Perhaps, ominously so. It does seem that growers of both apples and pears have gone to the best varietal resistance they can find. Only time will tell.

J. M. Thompson
Byron

ARKANSAS

Fire blight continued as a serious disease of apples in Arkansas.

D. A. Slack
Fayetteville

ILLINOIS

Especially severe in 1980, because of violent weather conditions (strong winds) across Illinois in June and July.

S. M. Ries
Urbana

COLORADO

Very little blight in 1980. Only trace amounts in the commercial Bartlett areas. None reported on apples. The better growers used one streptomycin spray during late bloom as a protectant. My impression is that there was very little inoculum available early in the season. Weather conditions

during May were favorable for blight. High temperatures and no moisture in June was unfavorable for blight.

N. S. Luepschen
Grand Junction

MISSOURI

Despite unusually dry weather, fire blight was apparent in Missouri. However, once the high temperatures came, fire blight ended abruptly, as usual. Average high temperature in July was 102.7°F.

R. N. Goodman
Columbia

ONTARIO

Weather was favorable for fire blight in late spring and summer of 1980 in southwestern Ontario. Rainfall was above average and temperatures were warm. Disease incidence was greater than that observed in 1979. Blossom blight occurred in apples, especially in the cv. Idared; pears escaped blossom damage as bloom occurred during cooler weather. Shoot blight damage was moderate in both apples and pears. There were no reports of serious damage by fire blight to ornamentals. Other regions of the province reported no serious damage by fire blight.

W. G. Bonn
Harrow

NOVA SCOTIA

Would be considered a nil report for 1980. Occasionally observed on pears, but incidence low. Canker phase only present in Nova Scotia. No research being done.

R. C. Ross
Kentville

BRITISH COLUMBIA

Fire blight appears to be quiescent.

D. Lane
Summerland

THE NETHERLANDS

In 1979, such a heavy outbreak of fire blight occurred as not previously experienced in The Netherlands, mainly due to a sequence of specific weather conditions as never occurred before. Existing foci extended, some new arose. The main infected genera were Crataegus, Cotoneaster and Pyrus, in that order. The main foci were in the SW and the SE parts of the country and also in one of the new IJsselmeerpolders. For the first time also apples became infected, although in two regions only. This

explosion gave rise to larger scale governmental eradication actior than in any preceding year. Also the use of streptomycin was allowed f. the first time in The Netherlands, though only in pear orchards and with a safety-period of 8 weeks. It was only used on a limited scale.
In 1980, the development of the disease was very quiet, compared to that in 1979. In general the weather circumstances during the blossoming periods of the different host plants were not favourable, and also the summer offered unfavourable conditions for the development of the disease. Nevertheless, especially in the first months of the year, a relatively large number of infected hawthorns, left over from the preceding year, had to be rogued or skeletoned (i.e., pruned back to the stems). Later in the year, quite a large number of infected Cotoneaster shrubs were found and destroyed. Infection in pear orchards was relatively scarce, in apple orchards nearly absent. Main foci were as always in the SW and the SE part of the country. Circumstantial evidence exists that the prevailing wind direction (SW/NE) has played a role in the spread of the disease.

C. A. R. Meijneke
H. P. Maas Geesteranus
Wageningen

WEST GERMANY

Compared with the previous year, fire blight incidence was less in 1980. Weather conditions were very rainy but too cold, such that no infections could be detected in orchards. Only hawthorn hedges on the North Sea coast of Schleswig-Holstein and Niedersachsen were heavily infected at the end of the growing season.

Furthermore shrubs of Cotoneaster salicifolius and C. watereri mainly in the big cities on the River Rhine in Nordrhein-Westfalen showed infections. Diseased plants were eradicated by the Plant Protection service.

W. Zeller
Heikendorf

DENMARK

Fire blight is found in most Danish areas. In 1980, especially hawthorn hedges in West Jutland showed significant attacks. With a few exceptions, only weak attacks were found in nurseries and pear orchards. On Falster, where fire blight was found 12 years ago, the attacks were very weak in 1980, and in the "fire blight garden" at Boto infected plants could hardly be found.

A. Jensen
Lyngby

BELGIUM

Fire blight is practically everywhere present but it is not yet epidemic in the Limburg fruit area. Species and varieties most commonly affected

are: Cotoneaster salicifolius, Crataegus sp. and Durondeau, Comice, Conference and Triomph de Vienne pears.

W. Porreye
St. Truiden

ENGLAND

There was little fire blight in southeast England in 1980 but in two areas in the southwest moderate to severe primary blossom blight was seen on pear, apple, hawthorn, Sorbus and pyracantha. This was associated with unusually warm weather in mid-May and in early June, plus adequate rainfall, when these hosts were in bloom.

E. Billing
East Malling

FRANCE

A general survey for fire blight in France has been done by the Plant Protection Service at the national level in summer 1980. Just like last year, this survey shows that no fire blight occurs in other areas than previously reported (North and South West, see map in 1980 Newsletter). In both areas, the general activity of fire blight has been low, with few exceptions. This moderate activity is probably due to cold weather during bloom on both pear and apple.

North: Limited extension of the disease (max 5-6 km) southward, and between Lille and the Belgian border. Host plants in that area are almost exclusively hawthorns (Crateagus monogyna), with the exception of a few pear trees. For the first time in France, this year fire blight has been found on Cotoneaster sp. and Pyracantha sp.

South West: Two isolated outbreaks detected in 1979 (Loupiac, and Le Frêche) have now disappeared: the diseased trees have been removed, and no new symptom has been detected in the surroundings in 1980.

A. Garonne Valley: Fire blight has been very moderate during the spring blossom period. Unfortunately a rather severe infection on secondary blossoms took place in mid-August in 24 Passe Crassane orchards (near Marmande, about 10 km from last year's infections). Among these orchards few (5-6) were severely attacked and destroyed, the others have been trimmed and "cleaned" by pruning, with Plant Protection help and control.

B. Dax area: No enlargement of the contaminated zone. Few symptoms have been detected in pear orchards. A severe infection on apple's primary blossom (Golden Delicious, Reine des Reinettes) has been experienced for the first time in that area. The disease did not progress very far down in the trees, and after trimming they look like healthy trees, and yielded a normal crop. Fire blight has been isolated from hawthorn (Crateagus monogyna) and Mespilus sp. for the first time in the Dax area.

J. P. Paulin
Angers

POLAND

Fire blight occurred in northern part of the country, mainly on hawthorn and apples. The focus is being eradicated.

P. Sobiczewski
Skierniewice

NEW ZEALAND

This year we have seen a little fire blight in home garden pear trees around Auckland and in some commercial orchards in Central Otago, but not in serious proportions.

D. W. Dye
Auckland

SPAIN

A general survey for fire blight has been done in Spain, and we have not found Erwinia amylovora. We only have detected some outbreak of Pseudomonas syringae.

C. Noval Alonso
Madrid

IRELAND

Fire blight has not been recorded in Ireland.

P. F. Walsh
Dublin

SWITZERLAND

No fire blight in Switzerland as of today.

R. Grimm
Wadenswil

NORWAY

As far as known, fire blight has still not reached Norway.

H. Roed

ITALY

Up to now, no fire blight has appeared in Italy.

C. Bazzi
Bologna

GREECE

The disease has not been observed in Greece up to now.

P. G. Psallidas
Athens

DETAILS ON CURRENT FIRE BLIGHT RESEARCH REPORTED FROM SOME UNIVERSITIES AND EXPERIMENT STATIONS

THE NETHERLANDS

The efficacy against artificial inoculation with E. amylovora of 3 different copper compounds, 3 experimental bactericides, 7 fungicides of pome fruit culture, 4 disinfectants and 2 quinolate compounds were tested on Cotoneaster sp., pear and quince. In the preventive trials on flowering plants the 3 copper products were equally active. Two new bactericides reached the level of streptomycin; the other was somewhat inferior. The bactericidal side-effect of the fungicides was negligible. The disinfectants and quinoline compounds were ineffective. The curative action against flower infection of the 2 new bactericides tested, varied with the test plant. The 3 bactericides used, showed preventive action against shoot inoculation, but no curative control. There was a small noteworthy influence of the inoculum density of the inoculated bacterium on the control level. The chance that the two effective new bactericides will reach the stage of allowance is small; the development of the third is stopped. The obtained results will be published in Acta Horticulturae 117.

T. Kooistra
Plant Protection Service

The investigations on susceptibility of ornamental shrubs to E. amylovora were carried out on the genera of Cotoneaster, Crataegus, ornamental Malus, Pyracantha and Sorbus. A breeding program was set up to obtain resistant varieties of Pyracantha. By testing the vegatatively propagated progeny of the hybrids on susceptibility to fire blight, the complex nature of resistance was demonstrated. Some clones from the hybrids were highly susceptible, others highly resistant, but quite a number of clones possessed a varying degree of resistance. If a certain degree of resistance was present in the hybrid, this fact was obscured by the variation in symptom expression (i.e. variation in extent of shoot wilting, only leaf- or only stem resistance) of the individual plants within the clone, caused by differences in the physiological conditions of these plants.

H. P. Maas Geesteranus
Institute for Phytopath. Research

J. Heyting
Res. Station Arboriculture

The development of a spray-warning system based on the "Billing warning system" has been checked under Dutch climatic conditions.

C. A. R. Meijneke
Plant Protection Service

WEST GERMANY

Our research is concerned with the following topics:

1. Testing for resistance of apple and pear varieties.

2. Breeding for resistance in the genus Cotoneaster.

3. Chemical control: In vitro tests of fungicides, copper compounds, antibiotics and new chemicals against E. amylovora; in vivo tests with new bactericides on the testplot.
The new compound CG 9 78039 from CIBA GEIGY brought a similar good effect as streptomycin (paper together with Dr. Egli on the above Meeting) (?)

4. Epidemiology on ornamentals (together with Dr. Brulez)

5. Studies on the physiology of resistance on different ornamentals
a) Qualitative and quantitative changes of different enzymes
b) Role of phenolic compounds (Dr. Brulez, Heikendorf)

6. Biological control: Antagonistic effect of the epiphytic flora against E. amylovora (Dr. Brulez, Margot Isenbeck; University of Kiel)

7. Physiological effects of antibiotics after blight infection (Prof. Knösel, Dr. Cornils; University of Hamburg).

W. Zeller
Biol. Bundesanstalt

DENMARK

Investigations on prognoses are carried out making use of the "Billing system." Only preliminary results are obtained until now. There is no other research work carried out on fire blight in Denmark except registration and observation for attacks in new and old areas.

A. Jensen
Nat. Plant Path. Inst.

BELGIUM

We are at the moment trying several new products (not antibiotics) with very promising results (trials 1980).

W. Porreye
Research Station of
Gorsem

ENGLAND

Overwatering twig cankers on M26 rootstocks kept in the greenhouse showed a

random pattern of ooze production between mid-February, and June, with no obvious relation to environmental factors.

E. Billing
Fact [illegible]

POLAND

1. Study on the possibility to apply the prediction system of Billing.

2. Laboratory and greenhouse testing of plant material coming from abroad for presence of fire blight bacteria.

3. Field inspection of apple, pear and hawthorn stands. Observations on dissemination of fire blight. Identification of pathogen.

P. Sobiczewski
Res. Inst. of Pomology

SPAIN

We are making trials with bactericides in order to study its phytotoxicity on pear trees.

J. Moval Alonso
Dept. de Protec. Vegetal

ITALY

In these last 2-3 years we have increased the survey mostly of plant material imported from contaminated European contries. This greater worry is also in relation with the severe attacks of the disease in the southwest areas of France. The analyses of weather (during pear blossom period) of the last 15 years with Billing's system suggest that climate of the Po-valley presents in some areas, and in some years, risks of infection. Consequently, if the disease should be brought into our country, it would be difficult to keep under control.

C. Bazzi
Istituto Patol. veget.

NEW YORK

Studies on biological control of fire blight.

S. V. Beer
Cornell University

MISSOURI

Dr. F. M. Wallis, Lecturer, Faculty of Agric., Dept. of Plant Path., Univ. of Natal, South Africa (Pietermaritsburg) joined my lab for a year Post.

doc activity, studying the ultrastructural aspects of in vivo agglutination of E. amylovora.

R. N. Goodman
Univ. of Missouri

WEST VIRGINIA

The main objectives of the pear breeding and pathology research program at our station are as follows:

1. Evaluation of pear varieties, species and seedling materials, including those collected in Eastern Europe, for resistance to fire blight, scab, leaf spot, and psylla.

2. Improve method of inoculation and screening of seedlings in the greenhouse for fire blight resistance.

3. Determine relationship in degree of fire blight resistance between seedlings and cultivars of different ages.

4. Study the genetic inheritance and biochemical nature of fire blight resistance.

5. Study various phases of the life cycle of Erwinia amylovora.

T. van der Zwet & R. L. Bell
Appalachian Fruit Research Station

BRITISH COLUMBIA

Production and characterization of E. amylovora toxin in vitro.

D. Lane
Summerland Res. Station

Miscellaneous News

EEC Working Group

In 1979, a separate working group for fire blight research was founded by the EEC. It met for the first time in April 1979 in Brussels in order to discuss a program for an experimental field in southern France and to be financed partially by the EEC. This test plot was established near Dax. Meteorological data will be collected to check the warning system of Dr. Billing in this area. The working group has proposed to act in the following ways:

A. Co-ordinated programme

1. Development of biologicl research into the disease: external phase, survival of the agent throughout the winter, significance of certain vector insects, methods of biological control.

2. The Commission may provide assistance to the researchers in question during meetings to exchange information and possibly to draw up common programmes and will assist in organising courses for research workers in laboratories with substantial experience of the problem.

3. The Commission will assist in collecting information on a system based on the use of "indicator plants."

B. Common programme

An experimental orchard has recently been set up in the infected southern zone and this offers scope for experiments which should be open to all research teams interested. These joint experiments would cover:

1. The various methods of chemical control, comparing copper-based products and new molecules available from industry, using an antibiotic as a control, from the point of view of efficacy and any possible side effects. A detailed programme is to be drawn up by a working party under the direction of Mr. Paulin.

2. Testing different genotypes avaialble or in preparation, in order to make available in the future resistant varieties which produce high quality fruit. The countries concerned will send their proposals to be examined by a working group under the leadership of Mr. Thibault who is to lay down the detailed programme for this operation. Work would be concentrated initially on pear and apple trees, but might later be extended to cover ornamental varieties.

Fire Blight in Japan

According to Dr. K. Ryugo Professor of Pomology, University of California, Davis, Mr. Ichiro Okuse, a visiting scholar from Hirosaki University in Aomori Prefecture, reported recently that areas in northern Japan experienced a terrible infestation of fire blight on Bartlett pears in July 1979. This appeared to be the first major outbreak of fire blight in Japan. Aomari is the largest apple growing region in Japan. Mr. Okuse kindly requested membership in the ISHS Fire Blight Working Group.

No Fire Blight in Chile

In January of this year, I received a letter and positive documentation from Mr. de la Sotta Benavente, Executive Director of Agricultural Services in the Ministry of Agriculture, Santiago, who stated that there is no fire blight in Chile. The decision was based on numerous surveys and isolations from apples, pears and quinces in the fruit growing region of Padre Hurtado, located along the rivers Rio Maipo and Rio Mapocho. This survey confirmed a study by Cancino, Latorre and Larach in 1974 that all isolations yielded Pseudomonas syringae and not E. amylovora (Plant Dis. Reptr. 58(6):568-570, 1974). Unfortunately, this publication escaped my attention during preparation of the fire blight handbook. (Edit.)

Future Meetings

1981 July 27 - Aug. 5	Third International Symposium on Pear Growing, Corvallis, Oregon, USA. For details, contact: Dr. P. B. Lombard, Medford, Ore. 97501.
1982 Aug. 29 - Sept. 4	Twenty-first International Horticultural Congress, Hamburg, West Germany. For details, contact: Hamburg Messe und Congress GmbH, P. O. Box 302360, D-2000 Hamburg 36, W. Germany.
1983 Aug. or Sept.	Third International Workshop on Fire Blight Research, under auspices of the Intern. Soc. for Hort. Sciences, Bordeaux, France.

Locations Reporting Availability of Cultures of Erwinia Amylovora for Exchange Purposes

1. Ithaca, N.Y. - Beer, S. V.
2. Lyngby, DK - Jensen, A.
3. Kiel, WG - Schulz, F. A.
4. Heikendorf, WG - Zeller, W.
5. Skierniewice, Pol. - Sobiczewski, P.
6. Auckland, N.Z. - Dye, D. W.
7. Urbana, Ill. - Ries, S. M.
8. Columbia, Mo. - Goodman, R. N.
9. Harrow, Ont. - Bonn, W. G.
10. Wageningen, Neth. - Maas Geesteranus, H. P.

New Theses and Dissertations on Fire Blight

Hodges, Susan S.

"Interaction between a bacteriocin produced by Erwinia herbicola and the fire blight pathogen E. amylovora." (tentative)

M.S. Thesis, Cornell Univ., Ithaca, N.Y.

Isenbeck, Margot

"Possibility of biotherapy of E. amylovora in ornamentals."

Dip. Ing., Christian-Albrechts Univ., Kiel, West Germany.

Romeiro, Reginalda D.

"An agglutination factor present in apple seeds."

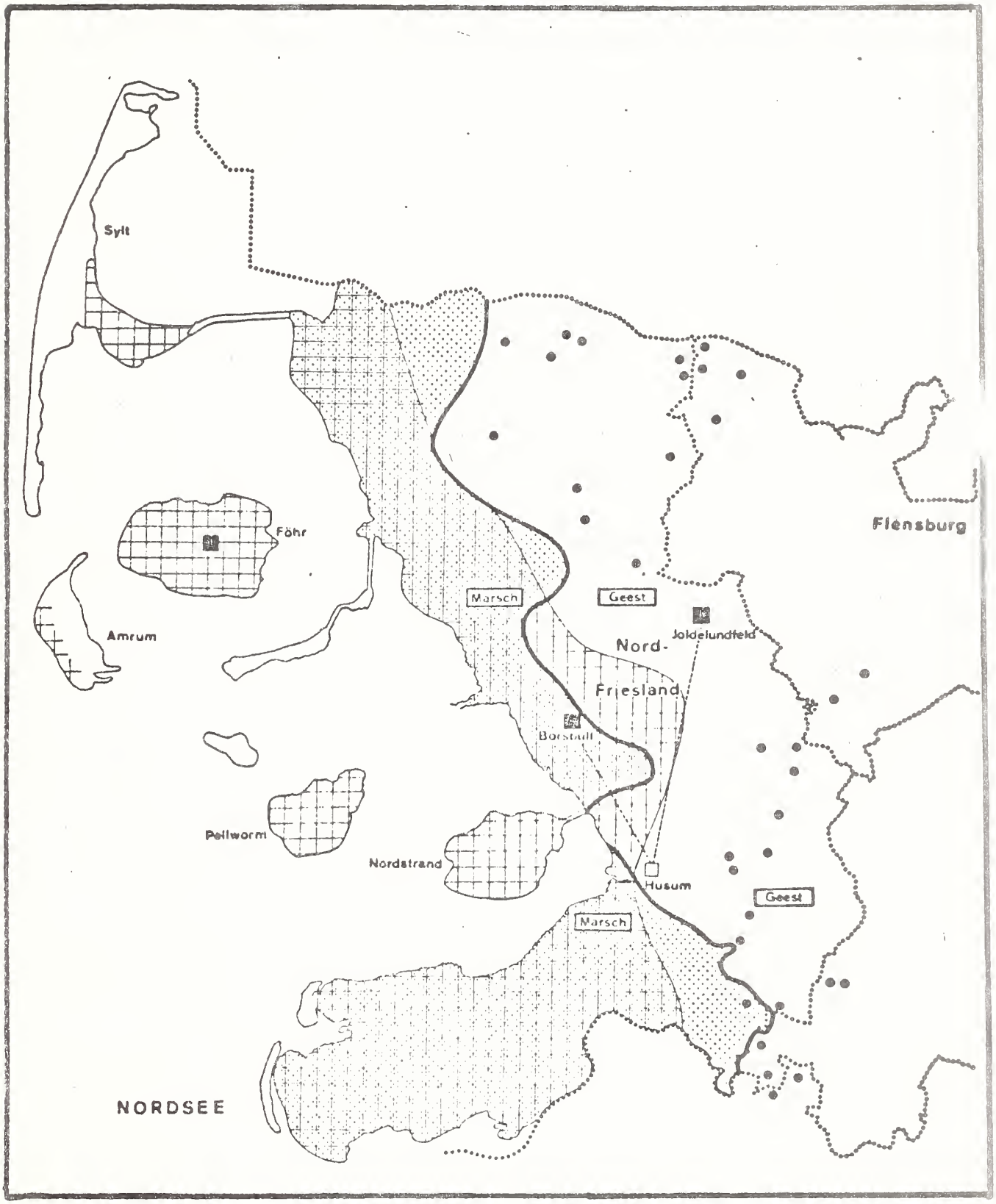
Ph.D. Dissert., Univ. of Missouri, Columbia.

Suhayola, C.

"The distribution and migration of Erwinia amylovora in apple vascular tissue following infection." December 1979.

M.S. Thesis, Univ. of Missouri, Columbia, 108 pp., illus.

Fireblight-testplots in Schleswig-Holstein



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ITALY	XII-T-17	Mazzucchi, U. and C. Bazzi. 1980. Il Colpo di Fuoco Batterico: Riconoscimento del Materiale Infetto ed Identificazi del Patogeno. Istituto Patol. Veget. Inform. Fitopat. Nr. 9: 3-20.
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CORRECTIONS IN FIRE BLIGHT LITERATURE

A. LITERATURE CITATION No. 949 IN THE USDA FIRE BLIGHT HANDBOOK 510 CITED AS:

Thomson, S. V., Schroth, M. N. and Moller, W. J.

Streptomycin resistant strains of Erwinia amylovora and their occurrence in pear orchards.

Phytopathology (In Press)

HAS APPEARED IN PRINT AS FOLLOWS:

Schroth, M. N., S. V. Thomson, and W. J. Moller

Streptomycin resistance in Erwinia amylovora.

Phytopathology 69: 565-568, 1979.

B. LITERATURE CITATIONS IN FIRE BLIGHT NEWSLETTER OF JANUARY 1980:

Page 17	Listed as IV-169	should read III-169
Page 21	Listed as XII-0-10	should read XII-0-19

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Zwet, T. van der, U. S. Department of Agriculture, Appalachian Fruit Research Station, Rt. 2, Box 45, Kearneysville, West Virginia 25430. (304-725-3451 ext. 29) (1) USA

Working Group Membership by Country[1/]

Argentina	Bergna, DA	
	Dobra, A.	
	*Meyer, F. C.	
Australia	Jenkins, P. J.	
	Wimalajeewa, S.	
Austria	Vukovits, G.	
Belgium	Geenen, J.	*Porreye, W.
	Laere, O. van	Veldeman, R.
	Luchene, K. van	
Brazil	Bredemeier, D.	
Canada	*Bonn, W. G.	Hunter, C. L.
	Cline, R. A.	Lane, D.
	Coulombe, L. J.	*McPhee, R.
	Crowe, A. D.	Muir, J.
	Davidson, J. G. N.	Quamme, H.
	Evans, I. R.	*Ross, R. G.
	Gibbins, L. N.	Rousselle, G. L.
	*Horricks, J.	Yorston, Y. M.
	Howard, R. J.	
Czechoslovakia	Kudela, V.	
	Paclt, J.	
	*Vondracek, J.	
Denmark	Andersen, H.	Jorgensen, H. A.
	Christensen, F. G.	Mosegard, J.
	Dinesen, G.	Simonsen, J.
	*Jensen, A.	
East Germany	*Kleinhempel, H.	
	Muller, H. J.	
	Vogelsanger, D.	
England	Alston, F. H.	Fox, R. T. V.
	Bennett, R. A.	Lelliott, R. A.
	*Billing, E.	Wiggel, D.
France	Lecomte, P.	Samson, R.
	Mathys, C.	Teissier, R.
	*Paulin, J. P.	Thibault, B.
	Ride, M.	
Greece	Panagopoulos, C. G.	
	*Psallidas, P. G.	

[1/]Names with asterisk (*) are contact persons.

Hungary	*Klement, Z. Valyi, S.	
India	Gupta, V. K.	
Ireland	*Walsh, P.	
Italy	*Bazzi, C. Ercolani, G. L. Fideghelli, C.	Garibaldi, A. Mazzucchi, U. Oberhofer, H.
Japan	Goto, M. Kato, T. *Okuse, I.	
Mexico	Fucikovsky, L.	
Netherlands	Heybroek, H. M. Heyting, J. Kooistra, T. Langeslag, J. J. J. *Maas Geesteranus, H. P.	Mijneke, C. A. R. Miller, H. J. Roosje, G. S. Scheer, H. A. T. van der Teylingen, M. van
New Zealand	*Dye, D. W.	
Norway	Dale, T. *Roed, H.	
Philippines	Soledad, S. V.	
Poland	Burkowicz, A. *Sobiczewski, P.	
Portugal	Martins, J. M. S. d'Olivera, M.	
Romania	Pirvan, P. *Severin, V.	
Russia	*Voronkova, L.	
South Africa	Erskine, J. M. *Matthee, F. N.	
Spain	Lopez, Gonzalez, M. Mansergas, A. J. F. *Noval Alonso, C.	Palazon, I. Sanchezmonge, E.
Sweden	*Graberg, M. Kroeker, G.	Olsson, K. M.
Switzerland	Bolay, A. Egli, T.	*Grimm, R. Joseph,
Turkey	Baykal, N.	

USA

Abdel-Rahman, M.
Aldwinckle, H. S.
Ark, P. A.
Bailey, C. H.
Barrat, J. G.
Bates, J. J.
*Beer, S. V.
Bell, R. L.
Berggren, J.
Berry, D. W.
Beutel, J. A.
Biehn, W.
Blake, R. C.
Burr, T. J.
Bushong, J. W.
Cameron, H. R.
Carlson, R. F.
Carroll, V. J.
Chandler, D.
Civerolo, E. L.
Clayton, C. N.
*Covey, R. P.
Crassweller, R.
Cummins, J. N.
*Davidson, S.
Dowler, W. M.
*Drake, C. R.
Egolf, D. R.
French, J. R.
Gilpatrick, J. D.
*Goodman, R. N.
Harnish, W.
Heimann, M. F.
*Hickey, K. D.
Hildebrand, E. M.
Hough, L. F.
Janick, J.
Johnson, D. E.
Jones, A. L.
Kado, C. I.
*Klos, E. J.
Koenigshof, R.
Kuc, J.
Lacy, G. H.
Lamb, R. C.
Landis, W. R.
*Lombard, P. B.
*Luepschen, N. S.
McIntyre, J.
McSwan, I. C.
Miller, R. W.
*Moller, W. J.
Morehead, G. W.
Mowry, J. B.
Norelli, J. L.
Opgenorth, D. C.
Otterbacher, A.
Parker, K. G.
Pecknold, P. C.
Preczewski, J. L.
*Preiser, F.
Rackham, R. L.
*Ries, S. M.
*Ritchie, D. F.
Rom, R. C.
Rosenberger, D. A.
Ryugo, K.
Sands, D. C.
Sasser, M.
Schroth, M. N.
Seem, R. C.
*Slack, D.
Spotts, B. P.
Starr, M. P.
Stushnoff, C.
Sugar, D.
Sutton, T. B.
Swanson, B. T.
Szkolnik, M.
*Thompson, J. M.
Thomson, S. V.
Wade, E. K.
Way, R. D.
*Weaver, L. O.
Westwood, M. N.
Williams, E. B.
Yoder, K. S.
Zehr, E. I.
Zoller, B. G.
*Zwet, T. van der

West Germany

Brulez, W.
Cornils, H.
Duben, J.
Franz, W.
Graf, H.
Hoppe, H.
Isenbeck, M.
Knosel, D.
Ottermann, A.
Paetzholdt, M.
Persiel, F.
Prillwitz, H. G.
Reimann-Philipp, R.
Rose, E.
Rudolph, K.
Schaper, U.

Kraus, P.
Lehmann-Danzinger, H.
Massfeller, D.
Meyer, J.
Michel, H. G.
Muller, K.
Schmidle, A
Schmidt, H.
Schulz, F. A.
Seemuller, E.
Stark, C.
*Zeller, W.

Yugoslavia

*Arsenijevic, M.
Stankovic, D.

SUMMARY

Contact Persons for Fire Blight Newsletter

United States	
Arkansas	Slack, D.
California	Moller, W. J.
Colorado	Luepschen, N. S.
Delaware	Davidson, S. H.
Georgia	Thompson, J. M.
Illinois	Ries, S. M.
Maryland	Weaver, L. O.
Michigan	Klos, E. J.
Missouri	Goodman, R. N.
New Jersey	Preiser, F.
New York	Beer, S. V.
North Carolina	Ritchie, D. F.
Oregon	Lombard, P. B.
Pennsylvania	Hickey, K. D.
Virginia	Drake, C. R.
Washington	Covey, R. P.
West Virginia	van der Zwet, T.

Canada	
Alberta	Horricks, J.
British Columbia	McPhee, R.
Nova Scotia	Ross, R. G.
Ontario	Bonn, W. G.

Other Countries	
Argentina	Meyer, F. C.
Belgium	Porreye, W.
Czechoslovakia	Vondracek, J.
Denmark	Hockenhull, J.
England	Billing, E.
France	Paulin, J. P.
Germany (East)	Kleinhempel, H.
Germany (West)	Zeller, W.
Greece	Psallidas, P. G.
Hungary	Klement, Z.
Ireland	Walsh, P.
Italy	Bazzi, C.
Japan	Okuse, I.
Netherlands	Maas Geesteranus,H. P.
New Zealand	Dye, D. W.
Norway	Roed, H.
Poland	Sobiczewski, P.
Romania	Severin, V.
Russia	Voronkova, L.
South Africa	Matthee, F. N.
Spain	Noval Alonso, C.
Sweden	Graberg, M.
Switzerland	Grimm, R.
Yugoslavia	Arsenijevic, M.

SUMMARY

Persons Interested in Fire Blight

Country	Interest Category 1	2	3	4	Total	Number of Contact Persons
* USA - United States	34	50		6	90	17
* CND - Canada	3	14			17	4
* BRD - West Germany	11	13	5		29	1
* NL - Netherlands	5	5			10	1
* DK - Denmark	2	5			7	1
* FR - France	3	1	3		7	1
* UK - England	2	4			6	1
* BLG - Belgium	3	2			5	1
* DDR - East Germany			3		3	1
* POL - Poland	1		1		2	1
* JAP - Japan		1	2		3	1
* NZ - New Zealand		1			1	1
* MEX - Mexico		1			1	
ITA - Italy			6		6	1
SPN - Spain			5		5	1
SWT - Switzerland			4		4	1
CZE - Czechoslovakia			3		3	1
SWD - Sweden			3		3	1
ARG - Argentina			3		3	1
AUS - Australia			2		2	
GRC - Greece			2		2	1
HUN - Hungary			2		2	1
NOR - Norway			2		2	1
POR - Portugal			2		2	
ROM - Romania			2		2	1
SA - South Africa			2		2	1
YUG - Yugoslavia			2		2	1
BRA - Brazil			1		1	
IND - India			1		1	
IRL - Ireland			1		1	1
OST - Austria			1		1	
PHI - Philippines			1		1	
TUR - Turkey			1		1	
RUS - Russia			1		1	1
TOTAL	64	97	61	6	228	45

* Countries with fire blight.

Fire Blight Mailing List Questionnaire

The list of ...es in this Newsletter is an annual attempt to establish a complete and updated mailing list of all persons interested in fire blight. Please make corrections and additions where necessary and send me any new names not listed. A new list will be prepared for the next newsletter.

☐ My name, address and telephone are correct (if not, show change below)

☐ My interest in fire blight is correct (if not, please indicate below)

☐ My name should be dropped from this list

☐ My/other name should be added to this list

NAME ______________________________

ADDRESS ______________________________

____

ZIP ______________________________

TELEPHONE ______________________________

Interest in fire blight research: 1 2 3 4

Interest in fire blight newsletter: YES NO

I will serve as contact person for newsletter questionnaire: YES NO

} Please circle one of each

____

Please return to your contact person or directly to:

T. van der Zwet
Appalachian Fruit Research Station
Route 2, Box 45
Kearneysville, West Virginia 25430

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